General

Guideline Title

Carpal tunnel syndrome.

Bibliographic Source(s)

Carpal tunnel syndrome. In: Hegmann KT, editor(s). Occupational medicine practice guidelines. Evaluation and management of common health problems and functional recovery in workers. 3rd ed. Elk Grove Village (IL): American College of Occupational and Environmental Medicine (ACOEM); 2011. p. 1-73.

Guideline Status

This is the current release of the guideline.

Regulatory Alert

FDA Warning/Regulatory Alert

Note from the National Guideline Clearinghouse: This guideline references a drug(s) for which important revised regulatory and/or warning information has been released.

- March 22, 2016 – Opioid pain medicines : The U.S. Food and Drug Administration (FDA) is warning about several safety issues with the entire class of opioid pain medicines. These safety risks are potentially harmful interactions with numerous other medications, problems with the adrenal glands, and decreased sex hormone levels. They are requiring changes to the labels of all opioid drugs to warn about these risks.

Recommendations

Major Recommendations

General Approach and Basic Principles

Carpal tunnel syndrome (CTS) occurs when symptoms occur that are attributable to abnormal median nerve compression within the carpal tunnel – a narrow, rigid passageway of ligament and bones at the base of the hand which houses the median nerve and flexor tendons. The median nerve supplies sensations to the palm side of the thumb, index, middle and radial half of the ring finger, as well as the dorsal segment of each of those four digits from the distal interphalangeal (DIP) distally, but not the fifth digit, as well as innervation to some small muscles (lateral two lumbricals,

opponens pollicis, abductor policis brevis and flexor pollicis brevis) in the hand that allow the fingers and thumb to move. Often, the condition arises without apparent cause. Patients who have open injuries, unstable fractures, wrist fractures, or acute gout attack that results in acute CTS require immediate referral to a surgeon since improvement may only be obtained through surgery. Sometimes, synovial thickening around tendons or other swelling narrows the carpal tunnel and causes the median nerve to become variously compressed or enlarged through poorly understood processes. The result may be tingling, numbness, pain, or weakness in the digits. Pain, if present, may also radiate proximally. Although painful sensations may indicate other conditions, CTS is the most common and widely known of the entrapment neuropathies in which the body's peripheral nerves are compressed or traumatized, affecting an estimated 4 to 10 million Americans.

Summary Tables: Recommendations and Evidence

Table 1 is a summary of the recommendations from the Evidence-based Practice Hand, Wrist, and Forearm Panel for diagnostic testing for CTS. Table 2 is a summary of recommendations for managing CTS. Table 3 is a summary of ergonomic recommendations related to CTS and Table 4 is a summary of post-operative rehabilitation recommendations. The recommendations are based on critically appraised higher quality research evidence and on expert consensus observing First Principles when higher quality evidence was unavailable or inconsistent. The reader is cautioned to utilize the more detailed indications, specific appropriate diagnoses, temporal sequencing, prior testing or treatment, and contraindications that are elaborated in more detail for each test or treatment in the body of this Guideline in using these recommendations in clinical practice or medical management. These recommendations are not simple "yes/no" criteria, and the evidence supporting them is in nearly all circumstances developed from typical patients, not unusual situations or exceptions.

Recommendations are made under the following categories:

- Strongly Recommended, "A" Level
- Moderately Recommended, "B" Level
- Recommended, "C" Level
- Insufficient-Recommended (Consensus-based), "I" Level
- Insufficient-No Recommendation (Consensus-based), "I" Level
- Insufficient-Not Recommended (Consensus-based), "I" Level
- Not Recommended, "C" Level
- Moderately Not Recommended, "B" Level
- Strongly Not Recommended, "A" Level

Table 1. Summary of Recommendations for Diagnostic Testing for CTS

Test	Recommendation(s)
Electrodiagnostic Studies (EDS)	Quality EDS to assist in securing a firm diagnosis for those patients without a clear diagnosis of CTS. EDS also recommended as one of two methods to attempt to objectively secure a diagnosis of CTS prior to surgical release – Recommended, Evidence (C) EDS for initial evaluation of most CTS patients – Not Recommended, Insufficient Evidence (I) EDS prior to glucocorticosteroid injection for CTS patients – Not Recommended, Insufficient Evidence (I) Commercial products for performing EDS for CTS patients – No Recommendation, Insufficient Evidence (I)
Ultrasound	Ultrasound to diagnose CTS – No Recommendation, Insufficient Evidence (I)
Magnetic Resonance Imaging (MRI)	Magnetic resonance imaging to diagnose CTS – No Recommendation, Insufficient Evidence (I)

Table 2. Summary of Recommendations for Managing Carpal Tunnel Syndrome

Disorder	Treatment with Evidence Rating/Recommendation Level		
	Recommended	No Recommendation	Not Recommended
Carpal Tunnel Syndrome	Work be restricted to tasks that do not involve high-force, stereotypical hand gripping or pinching or use of high acceleration vibrating hand-held tools (I) Education for select patients (I) Exercise for rehabilitation of post-operative CTS patients with significant deficits (I) Non-steroidal anti-inflammatory drugs (NSAIDs) for post-operative management of CTS-related pain (B) Acetaminophen for post-operative management of CTS-related pain (C) Oral glucocorticosteroids for acute, subacute, or chronic CTS among patients who decline carpal tunnel injection (B) Carpal tunnel injections for subacute or chronic CTS (A) Carpal tunnel injections for acute CTS without fractures (I) Limited use of opioids for a few days to control pain for select patients who have undergone recent carpal tunnel release and have large incisions or encountered complications (I) Lidocaine patches for select cases of acute, subacute, or chronic CTS with pain (I) Nocturnal wrist splinting for acute, subacute, or chronic CTS (B) Massage for select patients with acute, subacute, or chronic CTS who have significant myofascial pain (I) Ultrasound for acute, subacute, or chronic CTS for select patients who fail splint use or decline injection (C) Surgical release for patients who fail non-operative treatment for subacute or chronic CTS. Also, recommended for patients who have emergent or urgent indications (e.g., acute compression due to fracture, arthritides, or compartment syndrome with unrelenting symptoms of nerve impairment). (A) Either open or endoscopic release for treatment of subacute or chronic CTS. With either open or endoscopic, the effectiveness results from complete division of the flexor retinaculum. The procedure that the surgeon is most comfortable performing is recommended. (B) Use of Knifelight for subacute or chronic CTS (C) Biopsy of abnormal tenosynovium for subacute or chronic CTS (I) Pre-incisional antibiotics for consideration for patients with risk	Instruments to monitor the progress of patients with CTS (I) Exercise for chronic CTS (I) Yoga for acute, subacute, or chronic CTS (I) Other vitamins for treatment of acute, subacute, or chronic CTS (I) Acupuncture for acute, subacute, or chronic CTS (I) Biofeedback for acute, subacute, or chronic CTS (I) Manipulation of the wrist for acute, subacute, or chronic CTS (I) Iontophoresis for acute, subacute, or chronic CTS (I) Phonophoresis for acute, subacute, or chronic CTS (I) Insulin injections for acute, subacute, or chronic CTS (I)	NSAIDS and acetaminophen as a primary treatment for subacute or chronic CTS (C) Diuretics for acute, subacute, or chronic CTS in the absence of fluid retention states (B) Routine use of opioids for treatment of patients with pain due to acute, subacute or chronic CTS (I) Pyridoxine for routine treatment of acute, subacute, or chronic CTS in patients without vitamin deficiencies (C) Magnets for management of pain from acute, subacute, or chronic CTS (C) Low-level laser therapy for acute, subacute, or chronic CTS (C) Manipulation of the spine for acute, subacute, or chronic CTS (I) Massage for most patients with acute, subacute, or chronic CTS (I) Therapeutic touch for acute, subacute, or chronic CTS (C) Intramuscular injections for acute or subacute CTS (I) Intramuscular injections for chronic CTS (C) Botulinum injections for acute or subacute CTS (I) Botulinum injections for chronic CTS (C) Epineurotomy (B) Internal neurolysis (A) Flexor retinacular lengthening (B) Ulnar bursal preservation (B) Mini palmar incision using the ring finger as a guide does not require any special changes in the location of the incision. Therefore, altering the location of the incision to "superficial nervesparing incision" is not recommended. (C)

Disorder	Treatment with Evidence Rating/Recommendation Level		
	factors undergoing carpal tunnel release (I)		An incision that is placed too far ulnarly may result in damage to the ulnar nerve or artery, therefore, an ulnar incisional approach is not recommended. (C)
	Recommended Anesthesia, either local or regional, during carpal tunnel release (I)	No Recommendation	Not Recommended
			Flexor tenosynovectomy (C) Routine use of antibiotics for all patients undergoing carpal tunnel release (I) Contrast baths (C)

Table 3. Summary of Recommendations for Ergonomic Interventions for Distal Upper Extremity Musculoskeletal Disorders with an Occupational Basis and Return-to-Work Programs

Recommended	No Recommendation	Not recommended
Ergonomic interventions in settings with combinations of risk factors (e.g., high force combined with high repetition) to reduce risk factors for CTS (I) Use of alternate or split keyboards among select patients with common distal upper extremity tendinosis (I) Forearm support for frequent keyboard users for potential prevention of neck and/or shoulder symptoms (C) Trackball (instead of a mouse) for treatment of select patients with symptoms of CTS (I) Computer typing breaks for select patients with symptoms of CTS as well as for primary prevention (I) Ergonomics training in moderate- or high-risk manufacturing settings (I) Return-to-work programs for treatment of subacute or chronic hand, wrist, or forearm musculoskeletal disorders (MSDs), particularly patients with significant lost time (I)	Ergonomics training for prevention of musculoskeletal disorders in office settings (I)	Mandating typing in a 90° traditional posture for prevention of CTS (C) Mandating typing in a 90° traditional posture for treatment of CTS (I) Return-to-work programs for treatment of acute hand, wrist, or forearm musculoskeletal disorders (I)

Table 4: Summary of Recommendations for Post-Operative Rehabilitation for Carpal Tunnel Syndrome

Recommended	No Recommendation	Not recommended
Soft bandages (I) Splints for select patients (I) Non-steroidal anti-inflammatory drugs to control pain (B) Acetaminophen to control pain (I) Cryotherapy for post-carpal tunnel release patients (C) Cooling blanket (I) Post-operative patients or those with functional deficits should stay as active as possible and use the		Arnica (C)

Recommended	No Recommendation	Not recommended
hand as much as possible post-operatively or post-injury (I) Post-operative patients or those with functional deficits should perform graded, increased exercises post-operatively or post-injury. A home exercise program may accomplish this for many patients. (I) Post-operative patients should be observed particularly for failure to progress as expected, as well as for complex regional pain syndrome or other complications, and it is recommended that there should be a low threshold for institution of formal physical or occupational therapy for rehabilitation. Patients with functional deficits should have a home exercise program with low threshold to refer to therapy for formal treatment if deficits are considerable or there is a failure to progress as expected with a home exercise program. (I)		

Definitions:

Strength of Evidence Ratings

A = Strong evidence-base: Two or more high-quality studies*

B = Moderate evidence-base: At least one high-quality study or multiple moderate-quality studies** relevant to the topic and the working population

C = Limited evidence-base: At least one study of moderate-quality

I = Insufficient Evidence: Evidence is insufficient or irreconcilable

*For therapy and prevention, randomized controlled trials (RCTs) with narrow confidence intervals and minimal heterogeneity. For diagnosis and screening, cross sectional studies using independent gold standards. For prognosis, etiology or harms, prospective cohort studies with minimal heterogeneity.

**For therapy and prevention, well-conducted cohort studies. For prognosis, etiology or harms, well-conducted retrospective cohort studies or untreated control arms of RCTs.

Recommendation	Evidence Rating	Description of Category
Strongly Recommended	A	The intervention is strongly recommended for appropriate patients. The intervention improves important health and functional outcomes based on high quality evidence, and the Evidence-Based Practice Panel (EBPP) concludes that benefits substantially outweigh harms and costs.
Moderately Recommended	B	The intervention is recommended for appropriate patients. The intervention improves important health and functional outcomes based on intermediate quality evidence that benefits substantially outweigh harms and costs.
Recommended	C	The intervention is recommended for appropriate patients. There is limited evidence that the intervention may improve important health and functional benefits.
Insufficient - Recommended (Consensus-based)	I	The intervention is recommended for appropriate patients and has nominal costs and essentially no potential for harm. The EBPP feels that the intervention constitutes best medical practice to acquire or provide information in order to best diagnose and treat a health condition and restore function in an expeditious manner. The EBPP believes based on the body of evidence, first principles, or collective experience that patients are best served by these practices, although the evidence is insufficient for an evidence-based recommendation.
Insufficient - No Recommendation (Consensus-based)	I	The evidence is insufficient to recommend for or against routinely providing the intervention. The EBPP makes no recommendation. Evidence that the intervention is effective is lacking, of poor quality, or conflicting and the balance of benefits, harms, and costs cannot be determined.
Insufficient - Not	I	The evidence is insufficient for an evidence-based recommendation. The intervention is not recommended for

Recommendation	Evidence Rating	Description of Category
Recommended (Consensus-based)		appropriate patients because of high costs or high potential for harm to the patient.
Not Recommended	C	Recommendation against routinely providing the intervention. The EBPP found at least intermediate evidence that harms and costs exceed benefits based on limited evidence.
Moderately Not Recommended	B	Recommendation against routinely providing the intervention to eligible patients. The EBPP found at least intermediate evidence that the intervention is ineffective, or that harms or costs outweigh benefits.
Strongly Not Recommended	A	Strong recommendation against providing the intervention to eligible patients. The EBPP found high quality evidence that the intervention is ineffective, or that harms or costs outweigh benefits.

Clinical Algorithm(s)

An algorithm for evaluation and management of carpal tunnel syndrome (CTS) is provided in the original guideline document.

Scope

Disease/Condition(s)

Carpal tunnel syndrome (CTS)

Guideline Category

Diagnosis

Management

Rehabilitation

Treatment

Clinical Specialty

Family Practice

Internal Medicine

Orthopedic Surgery

Physical Medicine and Rehabilitation

Preventive Medicine

Surgery

Intended Users

Advanced Practice Nurses

Allied Health Personnel

Health Care Providers

Nurses

Occupational Therapists

Physical Therapists

Physician Assistants

Physicians

Utilization Management

Guideline Objective(s)

- To describe evidence-based best practices for key areas of occupational medical care and disability management
- To improve or restore the health of workers with occupationally related illnesses or injuries
- To improve the quality of occupational medical care and disability management

Target Population

Adults with potentially work-related carpal tunnel syndrome (CTS) seen in primary care settings

Interventions and Practices Considered

1. Electrodiagnostic studies
2. Work restriction
3. Patient education
4. Exercise
5. Post-operative analgesia (non-steroidal anti-inflammatory drugs [NSAIDs], acetaminophen, opioids)
6. Oral glucocorticosteroids
7. Carpal tunnel injections
8. Lidocaine patches
9. Nocturnal wrist splinting
10. Ultrasound
11. Surgical release (open or endoscopic)
12. Knifelight
13. Biopsy
14. Ergonomic interventions (forearm support for frequent keyboard users)
15. Post-operative rehabilitation (NSAIDs, cryotherapy)

Major Outcomes Considered

- Rates of symptom alleviation and cure
- Time to return to work

Methodology

Methods Used to Collect/Select the Evidence

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

The following databases were searched from 1966 to 2009:

- The National Library of Medicine's MEDLARS database (Medline) (www.nlm.nih.gov)
- EBM Online (www.bmjjournals.com)
- The Cochrane Central Register of Controlled Trials (www.cochrane.org/reviews/clibintro.htm)
- TRIP Database (www.tripdatabase.com)
- CINAHL (nursing, allied health, physical therapy, occupational therapy, social services: www.cinahl.com/wpages/login.htm)
- EMBASE (www.embase.com/)
- PEDro (www.pedro.fhs.usyd.edu.au/)

Ranking and Preliminary Screening of Studies

Primary sources selected for inclusion in the evidence base for American College of Occupational and Environmental Medicine (ACOEM) products and services are limited to those with the strongest apparent study design, pending quality rating. The strength and quality of study design are determined by ranking and rating of the studies according to accepted methods. Generally accepted ranking of study design for diagnostic testing and clinical treatment methods were modified by the Guideline Methodology Committee (GMC). Systematic reviews in general are not ranked as the best design in reality, as most reviews located during pilot testing of the Methodology, with the exception of many (but not all) Cochrane reviews, did not use systematic searches or quality assessments of included studies. The GMC also excluded level 4 evidence from consideration (case series, poor-quality cohort studies, poor-quality case-control studies, expert opinion without explicit critical appraisal, and expert opinion based on physiology, bench research, first principles). The focus was on the best-designed original studies, pending quality grading. For example, studies of diagnostic tests are generally limited to those compared to an acceptable gold standard, and those reporting sensitivity and specificity. Studies of clinical treatment methods are generally limited to randomized controlled trials or crossover trials. Additional literature was also reviewed when there was a paucity of higher-grade literature or if it was brought to Evidence Based Practice Panel's (EBPP's) attention from interested parties.

To narrow the data discovered in the search to that which will be acceptable for further analysis and quality rating, researchers use additional preliminary screening criteria for original research.

Criteria for Inclusion in Study Rating and Critical Analysis of Studies of Diagnosis/Clinical Assessment Methods

1. Evaluate the efficacy (i.e., clinical accuracy) of the assessment method (i.e., the "test") in a group that contains subjects both with and without the condition the test is intended to assess.
2. Be a prospective cohort study or an arm of a randomized controlled trial (RCT).
3. Compare the findings of the assessment method (test) to an adequate reference standard for all subjects (not just subjects who tested positive).

Criteria for Inclusion in Study Rating and Critical Analysis of Studies of Treatment Efficacy

1. Evaluate a group of subjects with a representative spectrum of the clinical condition of interest.
2. Be a randomized controlled trial evaluating clinical outcomes in a group receiving the intervention compared to a comparison group receiving either no intervention or a different intervention.
3. Evaluate functional outcomes that are important to a patient’s overall health or well being or are important to society.

Searches are documented, listing the database searched, the search terms, article type and limits, the time frame searched (in this case, all years in the databases), the number of studies found, the number reviewed in detail, and the number included in the systematic analysis. Despite multiple database searches, many additional studies are discovered in exhaustive manual searches of article reference lists.

Number of Source Documents

Not stated

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Strength of Evidence Ratings

A = Strong evidence-base: Two or more high-quality studies*

B = Moderate evidence-base: At least one high-quality study or multiple moderate-quality studies** relevant to the topic and the working population

C = Limited evidence-base: At least one study of moderate-quality

I = Insufficient Evidence: Evidence is insufficient or irreconcilable

*For therapy and prevention, randomized controlled trials (RCTs) with narrow confidence intervals and minimal heterogeneity. For diagnosis and screening, cross sectional studies using independent gold standards. For prognosis, etiology or harms, prospective cohort studies with minimal heterogeneity.

**For therapy and prevention, well-conducted cohort studies. For prognosis, etiology or harms, well-conducted retrospective cohort studies or untreated control arms of RCTs.

Methods Used to Analyze the Evidence

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

Study Assessment and Quality Rating

Studies are first abstracted into evidence tables for easier assessment. See Appendix B in the original guideline document for a sample of an evidence table for treatment studies. Each study is formally graded for quality using a modification of the most recent assessment scheme proposed by the Cochrane Collaboration Back Group, as shown in the table below. The studies are quality rated using a 0, 0.5, 1 grade for each item, where 0 = does not fulfill the requirement; 0.5 = partially fulfills the requirement and 1 = entirely fulfills the requirement. A study with a score less than 4.0 is rated as a poor-quality study; a study with a score between 4.0 and 7.5 is rated as a moderate-quality study. A study with a score of 8.0 or greater is rated as a high-quality study.

Rating Criteria for Randomized Controlled Trials of Treatment Studies

Criterion	Description
Randomization	Assessment of the degree that randomization was both reported to have been performed and successfully achieved through analyses of comparisons of variables between the treatment and control groups
Treatment allocation concealed	Concealment of the allocation of patients to various arms of the study from all involved, including patients, clinicians, and researchers
Baseline comparability	Measures how comparable the baseline groups are (e.g., age, gender, prior treatment)
Patient blinded	The patient is not aware which group he or she is in
Provider blinded	The provider is not aware which treatment he or she is delivering
Assessor blinded	The researcher is not aware which group the results apply to
Co-interventions avoided	The degree to which the study design avoided multiple interventions at the same time
Compliance acceptable	Measures the degree of noncompliance with the treatment protocol

Criterion	Description
Dropout rate	Measures the dropout rate at different periods of time
Timing of assessments	Assessments and reassessments should be performed at the same time from inception for all study groups
Analyzed by intention to treat	Whether the study data was analyzed with an "intention to treat" analysis

Methods Used to Formulate the Recommendations

Expert Consensus

Description of Methods Used to Formulate the Recommendations

Each recommendation includes citations of the specific scientific literature which supports the recommendation. The recommendations explicitly consider the health benefits, side effects, and risks of the proposed recommendation. Recommendations include the data elements described in the table below.

Content of Recommendations for Diagnostic Testing or Treatment

1. The diagnoses for which the test or treatment is indicated
2. The specific indications for the test or treatment
3. The point in the time course of the problem for which it is appropriate
4. Prior conservative treatment that should be tried first
5. Relative and absolute contraindications to the test or procedure
6. The number of tests or procedures that are appropriate at a given time in the course of the problem
7. The potential benefits of the test or procedure
8. The potential harms, including effects on disability and return to work

The Evidence Based Practice Panels (EBPPs) for each topic area review and discuss draft practice recommendations from the research staff that includes a review of the quality evidence, evidence tables, and summaries. The strength of evidence rating is confirmed by the EBPP responsible for the topic, with review by the Guideline Methodology Committee (GMC). EBPP members may present additional comments related to their clinical opinions and experience for panel consideration. If a unanimous decision is not possible, an EBPP may vote on the rating of the strength of the evidence to determine a consensus. Dissenters to the consensus may draft minority opinions about the strength of evidence. In practice, this has not happened as recommendations have been unanimous.

Formulation of recommendations requires clinical judgment as well as a full evaluation and consideration of the available high-quality evidence. To aid in framing recommendations, the GMC developed a list of "First Principles" based on the Hippocratic Oath ("First Do No Harm"), medical logic, appropriate sequencing and case management, shared decision-making, support of functional recovery, and relative cost-effectiveness. The First Principles are defined in Table 7 in the original guideline document. When there is insufficient high-quality evidence of effectiveness or efficacy, or the high-quality evidence is conflicting, and to guide recommendations for alternative tests or treatments when there are several options, these principles are used to guide group decision-making.

The EBPPs then assign a Strength of Recommendation, defined in Table 8, to each recommendation. If a consensus cannot be reached on the recommendation or strength of recommendation, the EBPPs may use nominal group voting if agreement is not possible in the discussion. Once a consensus is reached, the EBPPs will finalize the language and strength rating of the recommendation. If needed and material, a minority opinion can be appended to the recommendation.

Rating Scheme for the Strength of the Recommendations

Recommendation	Evidence Rating	Description of Category
Strongly Recommended	A	The intervention is strongly recommended for appropriate patients. The intervention improves important health and functional outcomes based on high quality evidence, and the Evidence-Based Practice Panel

Recommendation	Evidence Rating	Description of Category
		(EBPP) concludes that benefits substantially outweigh harms and costs.
Moderately Recommended	B	The intervention is recommended for appropriate patients. The intervention improves important health and functional outcomes based on intermediate quality evidence that benefits substantially outweigh harms and costs.
Recommended	C	The intervention is recommended for appropriate patients. There is limited evidence that the intervention may improve important health and functional benefits.
Insufficient - Recommended (Consensus-based)	I	The intervention is recommended for appropriate patients and has nominal costs and essentially no potential for harm. The EBPP feels that the intervention constitutes best medical practice to acquire or provide information in order to best diagnose and treat a health condition and restore function in an expeditious manner. The EBPP believes based on the body of evidence, first principles, or collective experience that patients are best served by these practices, although the evidence is insufficient for an evidence-based recommendation.
Insufficient - No Recommendation (Consensus-based)	I	The evidence is insufficient to recommend for or against routinely providing the intervention. The EBPP makes no recommendation. Evidence that the intervention is effective is lacking, of poor quality, or conflicting and the balance of benefits, harms, and costs cannot be determined.
Insufficient - Not Recommended (Consensus-based)	I	The evidence is insufficient for an evidence-based recommendation. The intervention is not recommended for appropriate patients because of high costs or high potential for harm to the patient.
Not Recommended	C	Recommendation against routinely providing the intervention. The EBPP found at least intermediate evidence that harms and costs exceed benefits based on limited evidence.
Moderately Not Recommended	B	Recommendation against routinely providing the intervention to eligible patients. The EBPP found at least intermediate evidence that the intervention is ineffective, or that harms or costs outweigh benefits.
Strongly Not Recommended	A	Strong recommendation against providing the intervention to eligible patients. The EBPP found high quality evidence that the intervention is ineffective, or that harms or costs outweigh benefits.

Cost Analysis

The guideline developers reviewed published cost analyses.

Method of Guideline Validation

Clinical Validation-Pilot Testing

External Peer Review

Internal Peer Review

Description of Method of Guideline Validation

Internal Quality Review

The Guideline Methodology Committee (GMC) assigns a committee member to each Evidence Based Practice Panel (EBPP) as a methodology consultant to assist with adherence to this methodology. The GMC reviews all recommendations for which there are questions about consistency with the defined methodology. If the GMC determines that the approved methodology has not been followed, leading to illogical or untenable recommendations, the GMC engages in direct discussions with the EBPP to reach agreement on revision. If there is no agreement or revision, then the matter will be considered by the American College of Occupational and Environmental Medicine (ACOEM) Board of Directors when the document is submitted for Board review.

External Review

ACOEM conducts external peer review of the ACOEM *Occupational Medicine Practice Guidelines* (APGs) and periodic revisions to 1) assure that all relevant high-quality scientific literature has been found, 2) assure that the important evidence from the relevant scientific literature relevant has been accurately interpreted, 3) solicit opinions on whether the findings and recommendation statements are appropriate and consistent with the evidence, and 4) obtain general information on the conclusions and presentation of materials from external topic experts. Professional and patient organizations, as well as panel members, ACOEM Board of Directors, etc., are invited to nominate external peer reviewers.

Peer reviewers are asked to comment on the completeness of the scientific literature evaluation in their topic area, the clarity and technical accuracy of the APGs evaluation and summary of the evidence, and the appropriateness of the Guideline findings and recommendation statements.

Stakeholder Input

In a cyclical manner, ACOEM will seek stakeholder input to understand the needs and preferences of those who may utilize or be affected by the use of clinical practice guidelines in workplace settings and in the workers' compensation system. ACOEM solicits input from clinicians, health care systems, workers or patients, employers, utilization reviewers, case managers, insurers and third party administrators, attorneys, regulators, and policy makers through a variety of mechanisms. Stakeholders will be asked for comments about their experience using existing clinical practice guidelines and related products and their suggestions for future improvements. They are also asked for input on the use of clinical practice guidelines in clinical care, case management, claim administration, claim adjudication, and in the development of policies and regulations.

To ensure editorial independence in the development process, the stakeholder groups will be asked for input about the APGs, but will not be informed of panel deliberations or shown drafts of practice recommendations before the formal release of the documents. In some cases, a member of a stakeholder group may participate as a member of a Guideline EBPP or may participate in peer review or pilot testing. However, all individuals involved in the APGs development, peer review, and pilot testing are asked to keep all information about the panel's deliberations and conclusions confidential until the APGs are formally released.

Pilot Testing

The guidelines are pilot tested to determine if the recommendations are clear, easy to use, and are generally useful. Pilot testers are not asked if they think the recommendations or process for development was appropriate.

Review by the GMC and the ACOEM Board of Directors

During the entire evidence-based product development process, the GMC will work with the Panels, editors, and research staff to ensure that the evidence-based product methodology is being followed, both in the literature evaluation process and development of conclusion and recommendation statements. The Board of Directors has an opportunity to comment on the Guidelines during the external review period. Their comments are reviewed by the Panel and any necessary changes are made to the Guidelines.

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The type of supporting evidence is identified and graded for each recommendation (see the "Major Recommendations" field).

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

- Accurate diagnosis of carpal tunnel syndrome
- Facilitation of recovery and prevention of recurrence of distal upper extremity musculoskeletal disorders
- Effective treatment resulting in symptom alleviation and cure
- Return to work programs are thought to reduce morbidity and improve function

Potential Harms

- False-positive and false-negative test results
- Surgery and medication side effects
- Caution is warranted regarding widespread use of topical anesthetics for potential systemic effects from widespread administration
- Some patients may experience local reactions with lidocaine patches, such as skin irritation, redness, pain, or sores.
- Risks of surgical decompression include complications of anesthesia, wound infection, complex regional pain syndrome, and damage to the median nerve.

Contraindications

Contraindications

- Wrist splints may have a relative contraindication to daytime use.
- Oral glucocorticosteroids are relatively contraindicated for patients with diabetes mellitus and may worsen glucose intolerance among those who are pregnant.

Qualifying Statements

Qualifying Statements

The American College of Occupational and Environmental Medicine (ACOEM) provides this segment of guidelines for practitioners and notes that decisions to adopt particular courses of actions must be made by trained practitioners on the basis of the available resources and the particular circumstances presented by the individual patient. Accordingly, the ACOEM disclaims responsibility for any injury or damage resulting from actions taken by practitioners after considering these guidelines.

Implementation of the Guideline

Description of Implementation Strategy

An implementation strategy was not provided.

Implementation Tools

Clinical Algorithm

Mobile Device Resources

For information about availability, see the *Availability of Companion Documents* and *Patient Resources* fields below.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Getting Better

IOM Domain

Effectiveness

Patient-centeredness

Identifying Information and Availability

Bibliographic Source(s)

Carpal tunnel syndrome. In: Hegmann KT, editor(s). Occupational medicine practice guidelines. Evaluation and management of common health problems and functional recovery in workers. 3rd ed. Elk Grove Village (IL): American College of Occupational and Environmental Medicine (ACOEM); 2011. p. 1-73.

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

2011

Guideline Developer(s)

American College of Occupational and Environmental Medicine - Medical Specialty Society

Source(s) of Funding

American College of Occupational and Environmental Medicine

Guideline Committee

Evidence-based Practice Hand, Wrist, and Forearm Panel

Composition of Group That Authored the Guideline

Panel Chair: J. Mark Melhorn, MD, FAAOS, FACOEM, FAADEP, FACS, FASSH, FAAHS

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Financial Disclosures/Conflicts of Interest

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National, Regional, Local Committee Affiliations—Board Chair, Current Past President and Current Chairman of Nomination Committee, and Member of Ethics & Discipline Committee, American Academy of Disability Evaluating Physicians; Member of Occupational Health Committee, Program Director for Expert Witness Program, and Program Director for Occupational Orthopaedics and Workers' Compensation: A Multidisciplinary Perspective, American Academy of Orthopaedic Surgeons

Guidelines Related Professional Activities—Lead Author, Section of Musculoskeletal Upper Extremity, *AMA Guides to the Evaluation of Permanent Impairment, 6th Edition*; Member, Advisory Board, *The Medical Disability Advisor*; Member, Medical Advisory Board, *Official Disability Guidelines (ODG)*; Member, Editorial Board, ACOEM's *APG Insights*; Developer and Medical Consultant, CtdMAP (MAP Managers and PHI (Physical Health Index)

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Research Grants/Other Support—None

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Guidelines Related Professional Activities—Reviewer of numerous journals; Member, Editorial Board, Human Factors; Member, Editorial Board, *Applied Ergonomics*

Research Grants/Other Support—Principal Investigator, "Effect of tool design on hand pain in dental practitioners" (NIOSH); Principal Investigator, "Occupational Biomechanics (Ergonomics) Training Program" (NIOSH Northern California Educational Resource Center); Co-investigator, "Ergonomic evaluation of endoscopists" (American Society of Gastrointestinal Endoscopy); Principal Investigator, "A pooled longitudinal analysis of workplace carpal tunnel syndrome" (NIOSH)

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Research Grants/Other Support—None

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Guidelines Related Professional Activities—None

Research Grants/Other Support—None

Financial/Non-Financial Conflict of Interest—None

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National, Regional, Local Committee Affiliations—Member, Board of Director's Medical and Professional Affairs Committee; Member, Krasnoff Advisory Group; Member, Performance Improvement Coordination Group; Member, EMR Implementation Team; Chair, Physician Workgroup Committee; Member, Graduate Medical Education Committee, Executive Committee of the Medical Staff, and Bylaws Committee, Nassau University Medical Center; Chairwoman and Co-Founder, Professional Women's Association, Nassau County Medical Center; Women's Liaison Officer and Member of Group on Educational Affairs, Association of American Medical Colleges

Guidelines Related Professional Activities—Self-study guide (2005) for neuromuscular rehabilitation and electrodiagnosis and rehabilitation of orthopedic and rheumatologic disorders (American Academy of Physical Medicine and Rehabilitation); Past Manuscript Reviewer, *Journal of Trauma*; Past Manuscript Reviewer, *Archives of Physical Medicine and Rehabilitation*; Past Editorial Board Member, *Clinical Pathways for Medical Rehabilitation*

Research Grants/Other Support—None

Financial/Non-Financial Conflict of Interest—None

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National, Regional, Local Committee Affiliations—Online Content Development Coordinator, American Academy of Physical Medicine and Rehabilitation; Board Member, American Board of Electrodiagnostic Medicine; Member, National VA Physical Therapy Professional Standards Board; Member, National VA Occupational Therapy Professional Standards Board; Member, Taubman Medical Library Journal Review Committee, University of Michigan; Member, Departmental Research Advisory Committee, Department of Physical Medicine and Rehabilitation, University of Michigan; Member of Clinical Executive Board and Professional Standards Board, Chair of Commodity Standards Board, and Member of Prosthetic Clinical Management Program Board, Ann Arbor Veterans Administration Medical Center

Guidelines Related Professional Activities—Member, Committee for review of Practice Parameters, American Association of Neuromuscular and Electrodiagnostic Medicine; Member, Editorial Board, *Journal of Occupational Rehabilitation*; Member, Editorial Board, *Archives of Physical Medicine and Rehabilitation*; Associate Editor, *Muscle and Nerve*; Member, Editorial Board, *Topics in Stroke Rehabilitation*; Editor, American Academy of Physical Medicine and Rehabilitation: EMG Case of the Month; Editorial Reviewer, *Clinical Neurophysiology*

Research Grants/Other Support—Principal Investigator, "Fatigue, discomfort and musculoskeletal disorders associated with standing and walking" (United Auto Workers/General Motors: Center for Health and Safety)

Financial/Non-Financial Conflict of Interest—None

Guideline Status

This is the current release of the guideline.

Guideline Availability

Electronic copies: To order a subscription to APG-I, the online version of the Guidelines, call 847-818-1800 or visit http://www.acoem.org/apg-i.aspx.

Print copies are available from the American College of Occupational and Environmental Medicine (ACOEM), 25 Northwest Point Boulevard, Suite 700, Elk Grove Village, IL 60007 by calling 847-818-1800 or order online at http://www.acoem.org/PracticeGuidelines.aspx.

Subscriptions to ACOEM's Practice Guidelines App are available for iPhone/iPod and iPad interfaces from the iTunes Web site.

Availability of Companion Documents

The following is available:

- Methodology for the update of the occupational medicine practice guidelines, 2nd edition. Elk Grove Village (IL): American College of Occupational and Environmental Medicine (ACOEM); 2008. Available from the ACOEM Web site .

Patient Resources

None available

NGC Status

This NGC summary was completed by ECRI Institute on December 20, 2011. The information was verified by the guideline developer on January 4, 2012. This summary was updated by ECRI Institute on October 28, 2013 following the U.S. Food and Drug Administration advisory on Acetaminophen. This summary was updated by ECRI Institute on September 18, 2015 following the U.S. Food and Drug Administration advisory on non-aspirin nonsteroidal anti-inflammatory drugs (NSAIDs). This summary was updated by ECRI Institute on June 2, 2016 following the U.S. Food and Drug Administration advisory on Opioid pain medicines.

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